

REMARKS

Claims 1 -- 31 are pending in the application. Claims 1, 4, 5, and 12-15 are allowed, claims 2, 3, 6-11, 16 and 17 are objected to, and claims 18-31 are rejected.

Drawings

The drawings were objected to by the Examiner due to poor printing quality. Improved quality drawings are attached.

Specification

The specification was objected to in that the symbol characters used in mathematical expressions are difficult to read. Replacement pages are provided which it is hoped the Examiner will find clearer.

Claim Objections

The corrections requested in paragraph 3 have been made.

Claims Rejections 35 USC 112

Claims 19 and 22-31 are rejected under 35 USC 112 for being indefinite. The required amendment has been made to claim 19 and this objection is believed to be overcome.

Claim Rejections - 35 USC 102

In this section of the official action, Claims 18, 20 and 21 were rejected under 35 USC 102(b) as being anticipated by Houben U.S. Patent 5,817,133. Favorable reconsideration of this rejection is respectfully requested in the light of the above amendments since, as will be shown below, these claims are now believed to be inventively distinguished over Houben.

More particularly both Houben and the present invention relate to morphological filtering and to opening and closing filtering involving maximum and minimum filtering. However, Houben teaches separate and individual implementation of maximum and minimum filters and does not teach a way in which computational efficiency can be improved by synergistic implementation of the two filters. Claim 18 has been amended to recite that the input data is segmented and that the segmentation used by the max filter is also made available to the min filter, as supported by the wording of Fig. 3 of the present application.

Claims 20 and 21 already teach this feature since they teach a segmentation pattern. Claims 20 and 21 have been clarified in a minor way to show that it is the same segmentation pattern that is used for each filter.

Houben does not teach segmentation but instead sampling. The Examiner points to sampling in Figs. 3A and 3B of Houben to suggest that the sampling in Houben anticipates segmentation in the present claims. Whilst the applicant does not accept this assertion, it is nevertheless pointed out that each of claims 18, 20 and 21 also specify that it is the *same* segmentation that is applied to both filters. However in Houben it is clear from a brief comparison between Fig 3A (the max filter) and Fig 3B (the min filter) that it is *not* the same sampling that is carried out in the two filters. The Max filter uses the sequence $m_0, m_1, m_2 \dots m_{M-1}$, whereas the Min filter uses the *opposite* sequence m_{M-1}, m_2, m_1, m_0 .

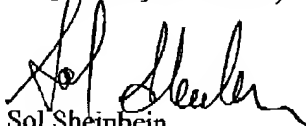
Furthermore the applicant is of the view that segmentation in the present application is not the same as sampling in Houben. In sampling, each sample is a single discrete value of an analog continuum, whereas in the present application a segment is a plurality of discrete data items that has been arbitrarily divided from a longer plurality.

There is nothing in Houben to suggest or even provide a hint at segmenting his discrete values in the first place and he certainly does not provide a hint at making the same segmentation available at both filters.

The importance of this is that the present invention provides an efficient computation system for carrying out morphological operations on image data. Image processing is a compute intensive operation and improving efficiency is a highly desirable goal. The present invention provides a way in which a standard sequential processor can implement maximum and minimum filtering in an efficient manner by making the same segmentation available to both filters. Houbens apparently has a dedicated signal processing device specifically designed for a particular analog signal, namely the biological type waveform shown in his figures. The present invention by contrast is efficient for any kind of waveform.

All of the matters raised by the Examiner have been dealt with and are believed to have been overcome. In view of the foregoing, it is respectfully submitted that all the claims now pending in the application are allowable over the cited reference. An early Notice of Allowance is therefore respectfully requested.

Respectfully submitted,



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Date: December 5, 2004